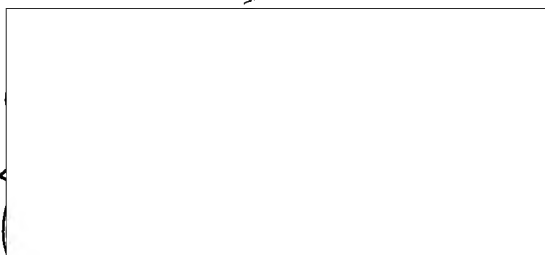


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April 10, 1957

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Dear Sir:

We are enclosing three (3) copies of Progress Report No. 3 on Project No. A-100.

Expenditures on this project during the month of February amounted to \$2,970.44 and during March \$3,928.92, leaving an expended and uncommitted balance of \$20,673.92.

If you have any questions or comments concerning this report please do not hesitate to call on us.

Sincerely yours,



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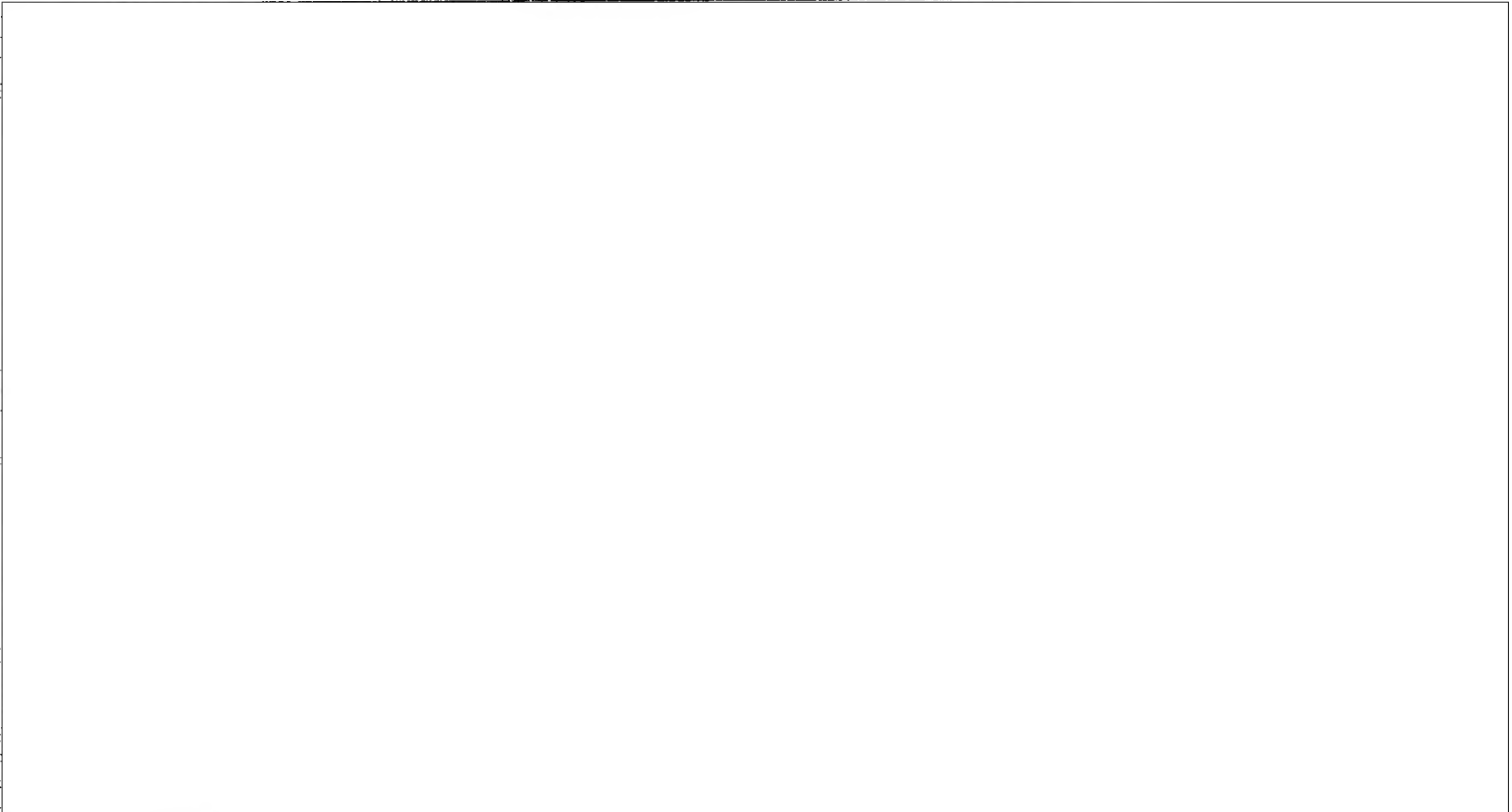
3 encls.  
RWB/es

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Project No. A-100

THICKNESS MEASUREMENT OF  
NON-METALLIC MATERIALS

Progress Report No. 4-5



**Page Denied**

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Project No. A-100  
THICKNESS MEASUREMENT OF  
NON-METALLIC MATERIALS  
Progress Report No. 3

for

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Copy No. 1

April 10, 1957

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## THICKNESS MEASUREMENT OF NON-METALLIC MATERIALS

### I. INTRODUCTION

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This is a report of the work done on  Project No. A-100 during the period of March 1, 1957, to March 31, 1957. The purpose of this project is to develop an ultrasonic method of determining the thickness of non-metallic materials. Because the measurement would be more difficult in a non-homogeneous material, such as concrete, than in tile or granite, and any method that would measure thicknesses in concrete would measure thickness in any other material that might be considered, it was decided that the case of concrete should be investigated. For this purpose, three 12-inch-square concrete blocks - one three inches in thickness, one six inches in thickness, and a second six inch thick block with a 1-1/4 inch hole extending three inches into the block - were prepared. Several barium titanate ceramic transducers, with resonant frequencies in the range of 50 kilocycles per second to 200 kilocycles per second, were obtained. Two types of holders were designed and used with these transducers. In general, the transducers were pulsed by a thyration circuit designed and built by the Acoustic Design Section, sending an ultrasonic wave train into the concrete block on which the transducer is placed. The wave train, reflected from the far side, is detected on its return, and the thickness is calculated from the travel time and velocity.

### II. PRESENT WORK

The reflected wave may be detected by the sending transducer or by a separate transducer. In the first case the transducer must be highly damped so that the original oscillation has almost completely decayed

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before the reflected signal returns; in the second case the entering wave train must be collimated and must not give use to other types of waves, parallel to the surface, which would reach the detector before the reflected wave. During the last month, the transducer geometry has been studied with a view to obtaining these conditions. Several arrangements of the transducers on hand were tried, none with conspicuous success. The results of this investigation, along with the results of a logical approach to the problem, have resulted in an alternate transducer geometry. The transducers for this new geometry have been ordered.

### III. FUTURE WORK

Studies with the present transducers will continue, but will be subordinated to studies with the new designs. At the same time it is planned to take some time for a more fundamental approach to the problem, in that the behavior of the various sonic waves in concrete will be studied.

### IV. NOTEBOOKS

The work on the project is being recorded in  Notebooks  
No. C-6516 and C-6529.

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### V. CONTRIBUTING PERSONNEL

The project is under the direction of  Some of  
the measurements on concrete were made by

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Respectfully submitted,

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